CLOSURE ASSEMBLY FOR A STORAGE CONTAINER

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates generally to the field of storage containers and closure assemblies for securing lids or covers to storage containers and, more particularly, to a closure assembly used to secure a lid or cover to an open-ended storage container such as a drum.

Description of Related Art

[0002] Open-ended storage containers, such as conventional metal drums, are used in a variety of industries for the bulk transportation and storage of goods and materials. These drums are cylindrical in shape and have one closed end and one open end. Other versions have closed ends with a small opening in one of the ends for admitting and dispensing materials and liquids to and from the drum. Whether the drums are "open-head" or "closed-head" drums, they are most commonly made of metal such as steel.

[0003] In general, open-head metal drums are formed with a rounded rim at the open end, also referred to as a "chime". U.S. Patent No. 5,829,624 to Skolnik et al. discloses a known rounded "chime" design used on open-head drums. A circular cover or lid having a rounded edge and circumferential groove capable of accepting the rounded rim or chime is applied to close the drum. In most applications, a polymeric gasket is inserted into the groove and between the rounded chime and the rounded edge of the cover. A typical polymeric gasket known in the art is disclosed by U.S. Patent No. 3,790,020 to Fine.

[0004] A typical closure assembly used in the art to secure a lid or cover onto the open end of an open-head drum is comprised of a metal split ring having two opposing ends and an inward-facing groove or recess formed in the body of the split ring. The groove has a cross-section formed to accept the rounded chime of the drum body and the rounded edge of the cover. A locking arrangement secures the cover onto the drum body. Typically, the locking arrangement is a fastener combination, such as a bolt and nut, that is used to draw the ends of the split ring together and secures the connection between the cover and drum body. The split ring also deforms the gasket located between the cover and chime of the drum body providing a seal between the cover and drum body. Typical metal split rings known in the art are illustrated in U.S. Patent Nos. 5,971,190 to Mannino; 6,435,576 and 4,982,864, both to Kusta; and 5,584,410 and 5,215,206, both to Siblik, all of which are incorporated herein by reference.

[0005] The design of most locking arrangements provided on metal split rings is comprised of two metal lugs, each being secured to one of the ends of the split ring, and a metal bolt and nut. Typically, one metal lug is threaded and the other metal lug is unthreaded and has a sufficient opening for accepting the metal bolt without engaging the threads of the bolt. The metal lugs are positioned parallel to each other and are aligned. The metal bolt passes through the unthreaded lug and engages the threads of the threaded lug so that by tightening the metal bolt into the threaded lug the two ends of the split ring are drawn together.

[0006] To ensure that a closure design for an open-ended drum is capable of maintaining an adequate seal during use, several government agencies, including the United States Department of Transportation, and other entities such as the United Nations, have promulgated regulations establishing certain tests that closed and open-head drums must pass in order to remain in commerce. All tests are conducted on randomly selected samples of drums or barrels supplied by manufacturers and reconditioners of drums. The most important of these tests as well as the most difficult to pass particularly for open-head metal drums is what is known as a "drop test". The procedure for a drop test requires the open-head drum to be filled with either a fine powder or liquid and then sealed. The drum is dropped from various specified heights in various specified orientations onto a flat, smooth, and non-resilient surface. To pass this test the drum must not rupture or leak. In one version, the drum is dropped at an angle so that an edge of the drum where the cover meets the drum body first contacts the hard surface.

[0007] To overcome the difficulties open-head metal drums have in passing the "drop test," various improvements have been proposed to improve the closure schemes used to secure lids to open-head drums. For example, U.S. Patent Nos. 5,590,802 to Mitchell and 5,445,293 to Schultz disclose purely mechanical improvements in the form of a clamping ring used to secure cooperating flanges extending outward from the lid and drum body together. U.S. Patent Publication No. 2003/0006234 to Maslowski discloses a similar design. Additionally, the Manning, Kusta and Siblik patents identified previously propose purely mechanical solutions in the form of improved split ring closures and mechanical fasteners used to secure the split ring to the cover and drum body of open-head drums.

[0008] Such purely mechanical solutions have not been entirely satisfactory in practice. Leakage still typically occurs at the interface between the cover and drum body and, further, near the opening of the split ring. Mechanical improvements in split ring closures may to some degree limit such leakage. However, it has generally been found in the art that such mechanical improvements are not completely adequate to ensure successful passage of the

drop test. Generally, such mechanically-improved clamping ring and split ring closures require the drum body and/or cover to be constructed of heavy-gauge steel, which produces disadvantages in cost, ease of handling, and weight. Furthermore, many of the mechanical improvements require the design and construction of entirely new clamping ring and split ring closures, which is undesirable in terms of engineering and construction costs.

[0009] Other materials such as high-density plastic or fiber-reinforced resin are also used to form such storage containers or drums. For example, U.S. Patent No. 5,875,915 to Bradshaw discloses an open-head container made entirely of plastic. The open-head container disclosed by Bradshaw et al. discloses a two-piece plastic closure or lid assembly for sealing the open end of the container. Another polymeric open-head container with a polymeric closure or lid assembly is disclosed by U.S. Patent No. 5,301,853 to Addison et al. Mechanical solutions to leakage problems have also been attempted in polymeric open-head containers. For example, U.S. Patent No. 4,880,138 to Pfeiffer et al. discloses a similar clamping ring to that disclosed by Mitchell, but the clamping ring is made of a polymeric material. Typical polymeric split ring closures are known in the art from U.S. Patent Nos. 5,713,482 and 5,129,537, each to Bordner.

[0010] In view of the foregoing, there is a need in the bulk container industry for an improved, low cost closure assembly for sealing lids or covers to storage containers, such as open-head drums. Additionally, there is a need for a closure assembly that is simple to manufacture and install on new and reconditioned storage containers. Further, there is a specific need for a closure assembly that will permit the use of lighter gauge metals in the construction of metal container bodies and covers.

SUMMARY OF THE INVENTION

[0011] The present invention is a container for transporting goods and materials and, more particularly, a container incorporating an improved closure assembly for securing a lid or cover to the container. Preferably, the container is an open-ended container and the closure assembly secures the lid or cover to the open-ended container. The container is comprised of an open-ended container body having a rim at the open end and a cover adapted to enclose the open end of the container body. The container further comprises a closure assembly for securing the cover to the container body. The closure assembly includes a coated split ring member cooperating with the cover and the rim of the container body and a locking device co-acting with the split ring member for securing the split ring member to the cover and the rim of the container body. Preferably, a polymeric coating is applied to at least an inward-

facing side of the split ring member. The split ring member has a cross-section configured to cooperate with the cover and the rim of the container body. The locking device co-acts with the split ring member to effect a seal between the cover and container body. The polymeric coating is applied to at least the inward-facing side of the split ring member, which contacts the cover and the rim of the container body.

[0012] The container may further include a gasket interposed between the cover and the rim of the container body. The container body, cover, and split ring member may each be made of metal, preferably steel.

[0013] The split ring member may comprise two free ends, each having a lug connected thereto. The locking device generally comprises the lugs, a bolt, and preferably a nut. The bolt extends through the lugs to draw the ends together and reduce the diameter of the split ring member for securing the split ring member to the cover and the rim of the container body. The lugs may comprise a threaded lug and an unthreaded lug. The bolt extends through the unthreaded lug and cooperates with the threaded lug to draw the ends of the split ring member together to reduce the diameter of the split ring member and secure the split ring member to the cover and the rim of the container body. The nut may be a jam nut cooperating with the bolt. The jam nut is preferably located between the lugs.

[0014] The polymeric coating may comprise polyvinylchloride. The split ring member may have the polymeric coating applied onto the split ring member to substantially encapsulate the split ring member. The polymeric coating may be further applied to the cover and to the container body at least in the area of the rim of the container body and rounded edge of the cover.

[0015] The polymeric coating preferably has a thickness of between about 15 - 30 mils on the split ring member. The polymeric coating may comprise a base layer applied directly on the surface of the split ring member and a top layer applied onto the base layer. The base layer preferably comprises an epoxy-acrylic blend and the top layer preferably comprises polyvinylchloride. The base layer may have a thickness of up to about 1 mil and the top layer may have a thickness of between about 15-25 mils on the base layer.

[0016] The present invention is further directed to methods of reconditioning used containers and manufacturing new containers that incorporate the closure assembly. In the bulk container industry, both new and used containers are used to transport goods and materials. In the method of reconditioning containers, the method generally comprises the steps of receiving an empty used container comprising a container body, cleaning at least the interior of the container body, applying a cover to the container body, and securing the cover

to the container body. The empty used container comprises a container body having an open end and a rim at the open end. The cleaning step includes at least cleaning the interior of the container body, for example to remove residue of previous contents of the container. The cover is applied to the rim at the open end of the container body. The step of securing the cover to the container body is accomplished with a split ring member having a cross-section configured to cooperate with the cover and the rim of the container body. The split ring member has a polymeric coating applied to at least an inward-facing side of the split ring member that contacts the cover and the rim of the container body.

[0017] The empty used container is received with an existing cover enclosing the open end and an existing split ring member securing the cover to the container body. Thus, the method will typically first include disassembling the empty used container to remove the existing cover and split ring member. The step of cleaning at least the interior of the container body may comprise oxidizing the container body and/or abrading, such as sand or shotblasting, the container body.

[0018] Once the container body has been cleaned, the method may further comprise the step of mechanically reforming the container body to substantially conform to original specifications of the container body. Once reformed, the method may comprise painting the container body and, more particularly, painting at least the exterior of the container body. The cover may also be painted prior to applying the cover to the rim at the open end of the container body. The cover may be a new or reconditioned cover. A gasket may be interposed between the cover and the rim of the container body.

[0019] Once the cover is applied to the container body, the coated split ring member may be applied to secure the cover to the container body. The polymeric coating is preferably applied to an uncoated split ring member to form the coated split ring member. The coating step is accomplished prior to the step of securing the cover to the container body.

[0020] The step of cleaning at least the interior of the container body may further comprise oxidizing the container body, removed cover, and removed split ring member and/or abrading the container body, removed cover, and removed split ring member after disassembling the container. The step of abrading the container body, removed cover, and removed split ring may comprise sand or shotblasting the container body, removed cover, and removed split ring. The container body, removed cover, and removed split ring are preferably mechanically reformed to substantially conform to original specifications of the container body, removed cover, and removed split ring. The container body and removed cover may also be painted. Furthermore, as stated previously, the polymeric coating is preferably applied to an uncoated

split ring member to form the coated split ring member. More preferably, the polymeric coating is applied to the removed and cleaned split ring member to form the coated split ring member prior to the step of securing the cover to the container body.

[0021] Moreover, the present invention is a method of manufacturing a closure member used to secure a cover or lid to an open-ended container having a rim. The method generally comprises the steps of providing a split ring member and applying a polymeric coating to at least an inward-facing side of the split ring member. The split ring member has a cross-section configured to cooperate with the cover and the rim of the container. The polymeric coating is applied to at least the inward-facing side of the split ring member adapted to contact the cover and the rim of the container. The step of applying the polymeric coating may comprise substantially encapsulating the split ring member with the polymeric coating.

[0022] The polymeric coating may comprise polyvinylchloride. The polymeric coating is preferably applied to a thickness of between about 15 - 30 mils on the split ring member. The polymeric coating may comprise a base layer applied directly on the surface of the split ring member and a top layer applied onto the base layer. The base layer preferably comprises an epoxy-acrylic blend and the top layer preferably comprises polyvinylchloride. The base layer is more preferably applied to a thickness of up to about 1 mil and the top layer is applied to a thickness between about 15-25 mils on the base layer.

[0023] The split ring member is preferably cleaned prior to applying the polymeric coating thereto. In particular, the method may include cleaning the at least inward-facing side of the split ring member prior to applying the polymeric coating thereto. The cleaning step may comprise oxidizing and/or abrading the at least inward-facing side of the split ring member. The abrading step may include sand or shotblasting the at least inward-facing side of the split ring member.

[0024] Additionally, the entire surface of the split ring member may be cleaned and the polymeric coating applied to the split ring member in accordance with the present invention. For example, the method may further comprise the steps of cleaning the surface of the split ring member and applying the polymeric coating to the cleaned surface of the split ring member. The cleaning step preferably comprises oxidizing the split ring member and/or abrading the surface of the split ring member.

[0025] Further details and advantages of the present invention will become apparent from the following detailed description when read in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] Fig. 1 is an exploded perspective view of a storage container incorporating a closure assembly, both in accordance with the present invention;

[0027] Fig. 2 is a plan view of the closure assembly shown in Fig. 1;

[0028] Fig. 3 is an enlarged detail view of a locking device of the closure assembly shown in Figs. 1 and 2;

[0029] Fig. 4 is a perspective view of a fastener used with the locking device of Fig. 3;

[0030] Fig. 5 is an enlarged cross-sectional view showing the interface between the closure assembly, cover, and container body for the storage container of Fig. 1; and

[0031] Fig. 6 is an enlarged cross-sectional view showing the interface between the closure assembly, cover, and container body for the storage container of Fig. 1 according to an additional embodiment.

DETAILED DESCRIPTION OF THE INVENTION

[0032] Referring to Fig. 1 a storage container 10 (hereinafter "container 10") in accordance with the present invention is shown. The container 10 of the present invention is preferably open-ended as illustrated and comprised generally of a container body 12, a cover or lid 14 for enclosing the open-ended container body 12 and a closure assembly 16 for securing the cover or lid 14 to the container body 12. Preferably, the container 10 is an open-head drum as is commonly used in the art for storage and transportation of bulk materials and goods. Accordingly, the container body 12 is generally cylindrical in shape and the cover 14 has a corresponding circular shape to enclose the container body 12. The cover 14 is secured to the container body 12 by the closure assembly 16.

[0033] The container body 12 includes a top, open end 18. The top, open end 18 of the container body 12 defines a rim or "chime" 20 that is generally rounded in cross-section as shown, for example, in Figs. 5 and 6, discussed herein. The container body 12 and rim 20 are conventional in the art. The container body 12 defines an opening 22 at the open end 18. The container body 12 is preferably formed of metal. A preferred metal for the container body 12 and cover 14 is steel. Generally, prior art drums or barrels and their lids or closures are made of 18 gauge (1.2 mm) steel. The closure assembly 16 of the present invention permits the use of thinner gauge metal for the container body 12 and cover 14 without compromising performance in the drop test discussed previously.

[0034] The lid or cover 14 is adapted to engage the top, open end 18 of the container body 12. More particularly, the cover 14 is adapted to seal against the rim or chime 20 at the open

end 18 of the container body 12. As stated, the cover 14 is circular shaped to match the cylindrical shape of the container body 12. The cover 14 defines a rounded edge 24. The bottom side of the cover 14 is adapted to seal against the rim 20 of the container body 12 and defines a circumferential groove 25 that receives the rim 20, as also shown in Figs. 5 and 6. As is well known in the art, the container 10 further includes a sealing gasket 26 made of rubber or other polymeric material positioned between the cover 14 and the rim 20 of the container body 12. The gasket 26 provides a substantially fluid tight seal between the cover 14 and the rim 20 of the container body 12. The gasket 26 is disposed in the circumferential groove 25 defined in the cover 14, as is conventional in the art.

[0035] Referring to Figs. 1-4, the closure assembly 16 is shown in greater detail. The closure assembly 16 includes a split ring member 28 configured to cooperate with the cover 14 and the rim 20 of the container body 12. The split ring member 28 defines a recess or groove 30 for receiving the rounded edge 24 of the cover 14 and the rim 20 of the container body 12. In particular, the recess or groove 30 is formed so that the split ring member 28 has a cross-section configured to cooperate with the rounded edge 24 of the cover 14 and the rim 20 of the container body 12, as shown in detail in Figs. 5 and 6. The split ring member 28 has two adjacent or opposing ends 32, 34 separated by a small opening or space 35. The split ring member 28 may be opened sufficiently to allow the split ring member 28 to be received about the cover 14 and the rim 20 of the container body 12. The split ring member 28 is preferably made of metal, such as steel, and preferably 12 (1.8 mm) gauge steel. Further, the split ring member 28 comprises a pair of lugs 36, 38 connected to the opposing ends 32, 34 of the split ring member 28, respectively. The lugs 36, 38 include a first lug 36 preferably having an unthreaded opening or hole 40 and a second lug 38 preferably having a threaded opening or hole 42. However, this configuration may be reversed.

[0036] The closure assembly 16 further comprises a locking device 50 co-acting with the split ring member 28 for securing the split ring member 28 to the cover 14 and the rim 20 of the container body 12 and to effect a seal between the cover 14 and the container body 12. Preferably, the locking device 50 comprises the lugs 36, 38 connected to the opposing ends 32, 34 of the split ring member 28 and a conventional bolt 52 co-acting with the openings 40, 42 defined by the lugs 36, 38. In particular, the bolt 52 is inserted into the unthreaded opening 40 in the first lug 36 and is secured in the threaded opening 42 in the second lug 38. The bolt 52 includes a bolt head 54 and a threaded shaft 56.

[0037] To secure the cover 14 to the open end 18 of the container body 12 and enclose the top opening 22 in the container body 12, the split ring member 28 is placed around the cover

14 and rim 20 of the container body 12 and the bolt 52 is inserted through the unthreaded hole 40 in the first lug 36 and engages the threaded hole 42 in the second lug 38. The opposing ends 32, 34 of the split ring member 28 are drawn together to tighten the split ring member 28 around the cover 14 and the rim 20 of the container body 12. In this manner, the gasket 26 is compressed between the rounded edge 24 of the cover 14 and the rim 20 of the container body 12, as shown in Figs. 5 and 6.

[0038] A well-known problem in the art is the spacing provided between the threaded shaft 56 of the bolt 52 and the unthreaded opening 40 in the first lug 36. This space allows undesired movement of the bolt 52 within the split ring member 28 when force is applied to the container 10, which allows movement of the split ring member 28. For example, if the container 10 is dropped or rolled, the space between the threaded shaft 56 of the bolt 52 and the unthreaded first lug 36 allows movement of the bolt 52 so that the lugs 36, 38 may become unaligned and the connection between the bolt 52 and the unthreaded first lug 36 is affected. To composite for this problem, a jam nut 58 is provided on the threaded shaft 56 between the lugs 36, 38. Thus, the bolt 52 is inserted through the unthreaded hole 40 and engages the threaded hole 42 to draw the opposing ends 32, 34 together. The jam nut 58 engages the threaded shaft 56 and secures the unthreaded first lug 36 between the head 54 of the bolt 52 and the jam nut 58. This configuration enables the closure assembly 16 to withstand impact forces without moving the bolt 52 within the space or opening 35 defined between the lugs 36, 38 and opposing ends 32, 34 of the split ring member 28.

[0039] Referring to Figs. 1-6, the closure assembly 16 of the present invention is improved over conventional split ring closures known in the art because a polymeric coating 60 is applied to at least portions of the split ring member 28. In particular, as shown in Fig. 5, the polymeric coating 60 is applied at least to an inward-facing side or surface 62 of the split ring member 28 adapted to contact the cover 14 and the rim 20 of the container 10. Additionally, as shown in Fig. 6, the polymeric coating 60 may be applied to the entire surface of the split ring member 28 including the lugs 36, 38 so that the split ring member 28 is substantially encapsulated (i.e., enclosed) in the polymeric coating 60. Reference numeral 62 is used to represent the entire surface of the split ring member 28 in Fig. 6.

[0040] The polymeric coating 60 applied to the split ring member 28 improves the closure characteristics of the closure assembly 16 in comparison to typical traditional metal split ring closures known in the art. In particular, the polymeric coating 60 increases the frictional coefficient between areas of contact between the split ring member 28 and the rounded edge 24 of the cover 14 and rim 20 of the container body 12. This frictional interaction prevents

the cover 14 from stripping-off the rim 20 of the container body 12 and through the split ring member 28 during drop tests. Additionally, the polymeric coating 60 has a degree of resiliency that accommodates and absorbs impact forces generated during drop tests. In summary, the polymeric coating 60 operates substantially as a resilient frictional film dampening impact forces during drop tests and increasing frictional interaction between the split ring member 28, cover 14, and rim 20 of the container body 12.

[0041] Numerous tests were conducted with the closure assembly 16 applied onto open-ended containers 10 of the present invention. The tests indicate an enhanced ability to withstand drop tests in open-ended containers 10. The containers 10 were dropped from a standard drop test height range of 47-71 inches. The containers 10 had 18 gauge (1.2 mm) steel covers 14 and container bodies 12. The use of the coated split ring member 28 and locking device 50 resulted in a substantial increase in pass rate when compared to prior art containers using conventional uncoated split ring closures. Additionally, the coated split ring members 28 permitted the gauge of metal used in the container body 12 to be reduced to 22 gauge (0.8 mm) and the cover 14 to be reduced to 20 gauge (0.9 mm) without compromising performance. The split ring members 28 were 12 gauge metal split ring members 28 that were coated with the polymeric coating 60. In summary, the closure assembly 16 of the present invention permits the use of thinner gauge metal in at least the container body 12 and cover 14 and, further, the split ring member 28 resulting in material and cost savings for the container 10. Additionally, the closure assembly 16 of the present invention will allow manufacturers or reconditioners of the container 10 to pass significantly higher drop tests.

[0042] The split ring member 28 is coated with the polymeric coating 60 according to the process described next. The split ring member 28 may be a "new" or "used" split ring member 28. In either case, the surface 62 of the split ring member 28 is cleaned to yield a near white metal condition. The cleaning step may include flame treatment, mechanical abrasion, and/or a chemical process. Preferred mechanical abrasion techniques include sand or shotblasting. Once the surface 62 of the split ring member 28 has been cleaned, the polymeric coating 60 is applied. Preferably, the polymeric coating 60 is comprised of two layers, a first or base layer 64 applied directly to the cleaned surface 62 of the split ring member 28 and a second or top layer 66 applied onto the base layer 64. The base layer 64 is preferably an epoxy-acrylic blend. A preferred material for the base layer 64 is manufactured by The Thermoclad Company under the trademark Duravin®, in particular Duravin® AES-CJN (12% solids) vinyl polymer. The material for the top layer 66 is also manufactured by The Thermoclad Company under the trademark Duravin®, in particular Duravin® BDG-1V.

The base layer 64 is applied as a thin coating of approximately 0.3-1 mil in thickness and the top layer 66 is applied to a thickness of between about 15-25 mils on the base layer 64. Overall, the polymer coating 60 has thickness of between about 15-30 mils on the surface 62 of the split ring member 28. The top layer 66 may be applied by conventional methods in the art such as fluidizing bed, flocking, or electrostatic deposition processes as long as the physical properties of the top layer 66 are not substantially altered. As indicated previously, the polymeric coating 60 may be applied to the entire exposed surface 62 of the split ring member 28, as shown in Fig. 6, or only the side or surface 62 of the split ring member 28 that faces and contacts the cover 14 and the rim 20 of the container body 12. Presently, the configuration of Fig. 6 is preferred for ease in manufacturing the coated split ring member 28.

[0043] The present closure assembly 16 may be used on both reconditioned containers and new containers. Generally, in the field of bulk storage containers, containers are provided either as reconditioned containers or as new containers. Accordingly, the container 10 illustrated in Fig. 1 may be a new or a reconditioned container 10.

[0044] For reconditioning, the used container 10 arrives empty at a reconditioning facility. Initially, the empty used container 10 is disassembled to remove the existing closure assembly 16 and cover 14 from the container body 12. The split ring member 28, cover 14, and container body 12 are then cleaned. The container body 12 is cleaned typically to remove residual contents that may be present within the container body 12. At least the interior of the container body 12 is cleaned to remove the residue of the previous contents of the container 10. The cleaning of the container body 12 may be accomplished by oxidizing (i.e., flame-treating) the container body 12 alone or with additional steps. Such additional steps include, for example, sand or shotblasting to remove any residue not removed by the flame treatment. Preferably, the container body 12 is flame-treated to at least 900° F for five (5) minutes to remove the residual contents that may be present in the container body 12. Similar oxidizing and/or abrading steps may be applied to the removed cover 14 and split ring member 28 to clean the cover 14 and split ring member 28.

[0045] Once the oxidizing and/or abrading steps are accomplished, the container body 12 and cover 14 are mechanically reformed by conventional mechanical means to substantially conform to original specifications for the container body 12 and cover 14. Alternatively, a new cover 14 may be provided for the container body 12. Next, the container body 12 is painted. In particular, at least the interior of the container body 12 is painted at least in part. The new or used cover 14 provided for the container body 12 may also be painted in accordance with the present invention. The split ring member 28 is prepared by the process

described previously. The split ring member 28 may also be mechanically reformed to original specifications. The container body 14 may also be leak-tested during the reconditioning process.

[0046] Once the reconditioned container body 12 and/or cover 14 is ready for additional goods or materials, the cover 14 is applied to the open end 18 of the container body 12 and secured thereto by the closure assembly 16. The gasket 26 is interposed between the cover 14 and the rim 20 of the container body 12 as described previously. The coated split ring member 28 is secured to the cover 14 and the rim 20 of the container body 12 with the locking device 50 in the manner described previously.

[0047] In the case of new containers, the closure assembly 16 works equally as well. The present invention is further directed to a method of manufacturing a new container 10 that generally includes the closure assembly 16. The method generally includes forming the container body 12 and cover 14. The container body 12 and/or the cover 14 may then be painted. Preferably, at least the exterior of the container body 12 is painted. The cover 14 is applied to the rim 20 at the open end 18 of the container body 12, typically with the gasket 26 interposed between the cover 14 and the rim 20 of the container body 12. The cover 14 is secured to the container body 12 with the coated split ring member 28 and locking device 50 of the closure assembly 16. The split ring member 28 has the polymeric coating 60 applied at least to the inward-facing side 62 of the split ring member 28 according to the process described previously.

[0048] As indicated previously, the closure assembly 16 yields improved performance for open-ended drums or containers when subjected to the drop test. In particular, the polymeric coating 60 applied to the split ring member 28 increases the frictional coefficient between the split ring member 28, the cover 14, and the rim 20 of the container body 12. Additionally, the polymeric coating 60 absorbs the impact of forces associated with the drop test, improving the performance of the container 10 during the drop test. The closure assembly 16 of the present invention eliminates the need for reconditioners of used containers 10 to match covers 14 and container bodies 12 according to wall thickness. The reconditioners of used containers 10 are now able to mix and match covers 14 and container bodies 16 without regard to wall thickness. Additionally, closure assembly 16 will simplify both the manufacturing of new containers and reconditioning of used containers 10.

[0049] While the present invention has been described with reference to particular embodiments of a closure assembly, container incorporating the closure assembly, method of manufacturing a closure assembly, and methods of manufacturing new and reconditioned

containers, those skilled in the art may make modifications and alterations to the present invention without departing from the spirit and scope of the invention. Accordingly, the foregoing detailed description is intended to be illustrative rather than restrictive. The invention is defined by the appended claims, and all changes to the invention that fall within the meaning and the range of equivalency of the claims are embraced within their scope.